

## Residential fuel cells keep Navy powered during blackout

by Dana Finney

When the major power failure hit the Northeast during August, it had no effect on 16 families living in the Quiet Harbor complex at the Naval Support Unit (NSU) in Saratoga Springs, New York. Their housing is equipped with eight proton exchange membrane (PEM) fuel cells, installed as part of the Department of Defense Fuel Cell Demonstration program which is managed by the Engineer Research and Development Center's Construction Engineering Research Laboratory (CERL).

The rest of the base was without power for about 4-1/2 hours, except for those other mission-critical activities with backup energy sources such as generators. The natural gas-fueled PEM fuel cells, which are non-polluting and use byproduct heat for cogeneration, performed as designed during the blackout.

"We set up the fuel cells at this site so that they will disconnect from the main utility in the event of a power failure," said Frank Holcomb, CERL project leader for the DoD demonstrations. "That means the individual quarters had electricity, which is what we intended." If the fuel cells had not disconnected from the grid, they actually would have tried to supply energy to the rest of the base, he said.

PEM fuel cells are targeted for residential use. They have DoD's interest as a clean and efficient source of power generation, and for their potential in distributed generation strategies including those developed for energy security. The systems installed at NSU Saratoga Springs produce 5 kW of electricity each, with two supplying all of the energy needs for a 4-unit family housing suite. The thermal energy produced during the fuel cells' internal reaction process is directed to residents' hot water heaters, and this ability to harness waste heat adds to the systems' overall efficiency.

The NSU - Quiet Harbor complex provides logistic and base operating support, comptroller duties and supply services (not direct<sup>1</sup> related to training) to the Naval Nuclear Power Training Unit, Ballston Spa, NY. The NSU also provides administrative, <sup>2</sup>ale, welfare and recreation, and personal property and housing services for DoD activities and related personnel.

The Naval Surface Warfare Center at China Lake, CA, funded CERL to install the NSU's fuel cells under the DoD demonstration. Both the Army and the Navy received a funding line item under the program, and the Navy elected to have the Army complete the New York project, in part due to a Broad Agency Announcement that had been implemented for the PEM fuel cells.

According to Holcomb, "This is basically a turnkey package where we lease the fuel cells for a year, with the vendor providing design, installation, and all operation and maintenance, as well as site restoration at the end of the demonstration. We also require at least a 90 percent availability during the year's demonstration, and we collect all of the operating data." The fuel cell stack must be replaced after about one year of operation, at which point the research program returns them to the manufacturer under the contract terms. Plug Power, Inc., is supplying the PEM units for the demonstration at NSU Saratoga Springs.

The U.S. Army Military Academy at West Point, NY, also has three of the PEM fuel cells. Tenants in the residences with these units selected five circuits in their existing panels for an uninterrupted power supply in the event of a grid failure. These houses also

used the fuel cells' waste heat for domestic hot water. Two of three fuel cells operated as they should have during the blackout, with one house having only enough power to operate the refrigerator.

"Two of the homes in the demonstration had air-conditioning, lights, and cold beer during the blackout," said Holcomb. "The third had cold beer, but residents would have had to enjoy it in the dark." Luckily their neighbors also had lights.

Fuel cells represent an emerging technology that may supply critical DoD energy needs in the future. The DoD Fuel Cell Demonstration Program seeks to gain performance data that can help manufacturers optimize the systems and make them affordable in a shorter timeframe than may otherwise be possible. Another goal is to explore the potential uses that could bring about economies of scale. The current PEM fuel cells cost about \$65,000 each.

*For more information about this article or the DoD Fuel Cell Demonstration Program, please contact Frank Holcomb at 217-352-6511, ext. 7412, [f-holcomb@cecer.army.mil](mailto:f-holcomb@cecer.army.mil), or visit the website at <http://www.dodfuelcell.com>.*